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RECENTLY PUBLISHED RESEARCH OF THE S.V. LEBEDEV PLANT
No 743

"Mechanism of the Polymerization of Hydrocarbons in Emulsions," A. I. Yurzenko, M. Kolschkova, S. V. Lebedev Plant No 743

"Dok Ak Nauk SSSR" Vol 47, 1945, pp 354-7

Since the mean radius of particles of emulsions of synthetic latexes is 0.05-0.07 μ and that of the emulsions of monomer 3.0-5.0 μ , it is unlikely that polymerization proceeds in the bulk or surface of the monomer droplet. Emulsion polymerization is conceived as proceeding through the stage of colloidal solution in the aqueous phase. By employing soap solutions as emulsifiers, the aqueous phase contains 10-15% of the monomer which concentrates mainly in the micelles of the soap. Polymerization occurs in the aqueous phase resulting in globules of polymer stabilized against coagulation by the molecules of the emulsifying agent. As the dissolved monomer is used up, new portions of it pass into the aqueous phase. This process, owing to the markedly increased interface area in the emulsion, proceeds very fast. The following basic data are in agreement with the above theory: (1) By using solid emulsifiers (bentonite or kaolin) no polymerization resulted, probably because aqueous phase is not hydrotropic. (2) The polymerization rate increases with concentration of emulsifier, other conditions being constant. (3) A series of experiments using various phase ratios, showed that the polymerization rate increases directly with the relative volume of the aqueous phase. (4) The reaction rates of the emulsifying agents investigated are in the order of their ability

- 1 -

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to dissolve hydrocarbon monomers: Na(K) oleate > NH_4 oleate > rosin soap > nekal > Na caseinate. (5) By using gaseous monomers latex was formed in soap solutions. Evidently in this case the monomer is dissolved in soap. The above concepts do not apply to polymerization of chloroprene where a fine dispersion of polymer is not formed.

"Solubility of Polymerizing Hydrocarbons (Monomers) in Aqueous Solutions of Emulsifying Agents," A. I. Yurzhenko, S. M. Mints, Lebedev Experimental Plant No 742

"Dok Ak Nauk SSSR" Vol 47, 1945, pp 106-8

In the polymerization of rubber-forming substances (I) in emulsions, e.g., in synthetic latex formation, part of the monomer passes from the droplets of the emulsion into the aqueous phase under the influence of the emulsifying agent (II). The solubility of the monomer was determined by shaking an excess of I with an aqueous solution of II for 30 minutes, and then measuring the n of the aqueous phase of the emulsion (III) in an Abbe refractometer. The concentration of I in % by volume, V_1 , was calculated from $W_1 = (P - P_0) / (P_1 - P_0) \cdot P_1$, and P_1 being the expressions $(n^2 - 1) / (n^2 + 2)$ for III, a pure solution of II, and pure monomeric I, respectively. II in concentrations of 3-5% was sufficient to bring up to 10-15% of monomer into solution. The hydrotropic action of II varied almost linearly with concentration; the effectiveness in solubilizing isoprene decreased in the order: K(Na)oleate (IV), NH_4 oleate, resin soap (Na salt), Na butyl α -naphthalenesulfonate, Na caseinate. The effectiveness of IV in solubilizing various I decreased in the order isoprene, styrene, acrylonitrile. The solutions of the hydrocarbons are indubitably colloidal in nature; the hydrocarbon would be concentrated chiefly in the micelles of II, and the solubility depends on the colloidal state of II itself. Accordingly, addition of free Na_2CO_3 to solutions of Na oleate sharply decreased the solubility of isoprene.

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